

Photosynthesis System

For Basic Research & Teaching



The success of our popular CIRAS-1 Portable Photosynthesis System has led to the development of a low cost photosynthesis system for classroom teaching, laboratory and field use.

- Lightweight & field portable
- Adjustable CO₂, H₂O and light for response curve data
- Simple to use
- Full data logging capability
- RS232 output for transfer of data to PC or printer
- Ideal for introduction of photosynthesis
- Affordable



Leaf Cuvette With Light Unit

From The Classroom ...



... To The Field



Measurement Theory

Measurement of CO₂ uptake is the most commonly used and easiest method for determining the photosynthesis rate of plants. Using infrared gas analysis techniques, we can readily determine CO₂ concentrations to within 1 ppm (part per million) and instantaneous measurements are possible.

The TPS-1 passes a measured flow of air over a leaf sealed into a chamber called the leaf cuvette. Using a valve, the TPS-1 first samples the CO₂ and H₂O in the air going to the cuvette and then in the air leaving the cuvette. From the flow rate and the change in the CO₂ and H₂O concentrations, the assimilation rate of CO₂ and the transpiration rate of water can be determined. This is commonly referred to as the "open system method of measurement". This is the method used by the TPS-1 for CO₂ measurements.

The TPS-1 is a completely self contained unit with all the necessary pumps, flowmeters and valves for measurements in the laboratory, classroom or field. Measurements can be made under ambient or changing conditions (CO₂, H₂O and light) for response curves. Comparative spot measurements, both inter- and intra-species, can readily be made.

TECHNICAL SPECIFICATION

CO₂ Infrared Gas Analyzer

Analysis Method

Non-dispersive, single cell infrared gas analyzer with microprocessor control and linearization.

- Thermostatted for temperature correction and fully pressure compensated.

CO₂ Measurement Range

0-2,000 ppm CO₂

CO₂ Precision

< 1 ppm at 300 ppm

H₂O Sensor

Range: 0-100% RH (Vaisala)
Accuracy: < 3% at 50% RH
Precision: < 1% RH

Internal Air Sampling Pumps

Sample Pump: Controlled at 200 ml/min.
Air Supply Pump: Controlled at 300 ml/min.

- Air supply at ambient through smoothing system.
- CO₂ and H₂O adjustable in steps from ambient or external supply.

Measured Parameters

- Reference and Analysis CO₂
- Reference and Analysis H₂O
- Temperature
- Light (PAR)

Calculated Parameters

- Assimilation (photosynthesis/respiration)
- Transpiration
- Stomatal Conductance
- Sub-stomatal CO₂
- Leaf Temperature

RS232 Output

Stored/current data output in standard ASCII format.

Data Storage

Full data logging capability (32K internal battery backed RAM).

Power Supply

12V 7.0 Ah rechargeable lead acid battery. Supplied with battery charger.

Operating Environment

0-45°C

Case Dimensions

290mm W x 199mm D x 110mm H

Weight

5.0 Kg. (including battery).

PLC Leaf Cuvette

Window Area

45 mm x 25 mm (11.25 cm²)

Stirring Fan

Provides efficient stirring of cuvette air ensuring rapid measurement.

Air Temperature Sensor

Precision Thermistor

Range: 0-60°C

Software linearization: +/- 0.10°C to +60°C

Accuracy: +/- 0.3°C at 25°C

PAR Sensor

Filtered Silicon Cell (fully cosine corrected)

Response: 400-700 nm

Precision: 15 umols/m²/s⁻¹

Light Control

Fan cooled white light unit provides manual control of light (0-1,500 umol/m²/s⁻¹). Supplied with gauze filters and diffuser.

Dimensions

250 mm L x 50 mm W

Weight

525 grams.

PP Systems is continuously updating its products and reserves the right to amend its specifications without notice.

Whilst every care has been taken in preparing the particulars contained in this publication, no responsibility can be assumed for possible inaccuracies or omissions.

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